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Saskatchewan Exploration and Development Highlights 1994

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Surface mineral exploration expenditures are estimated to be $35 million in 1994, an increase of $11 million, or 46 percent, over the actual 1993 figure (Table 1). Underground expenditures at the Cigar Lake, Eagle Point, and McArthur River test mines are forecast at $45 million, some four times surface uranium exploration, which has remained fairly stable for four years. Gold and base metal expenditures continue to be depressed; however, underground exploration and development at the Contact Lake and Komis mines lend some luster to the gold sector. Diamond exploration expenditures are the main area of growth and are estimated to be up by 65 percent from 1993.

Table 1 - Exploration expenditures.

	1993 (actual)	1994 (estimated)
Uranium	7 (58)	11 (47)
Gold	2 (5)	3 (7)
Base Metals	4	3
Diamonds	11	18
Total	24	35

Notes:
Figures are rounded to the nearest million dollars.
Uranium and gold test mine expenditures are in brackets.

URANIUM

Saskatchewan remains the focus of uranium exploration in Canada. Three major projects, Eagle Point, Dominique–Janine, and McClean Lake, have recently been approved for development and three more will be submitted to environmental review following the completion of Environmental Impact Statement (EIS) studies on two test mines, Cigar Lake and Midwest, and one underground exploration project, McArthur River. An excellent reserve base and spot prices of about $US 9.40/lb continue to curtail exploration. No new world class discoveries were made this year.

Cameco is the key player in uranium mining and exploration, controlling some 55 percent of currently identified reserves. Cameco's ownership is public shareholders (64.5%), Government of Saskatchewan (29.8%), and Government of Canada (5.7%). Saskatchewan's mines produced 8495 t U in 1993, making the province the world's leading producer with roughly 92 percent of Canadian output and 25 percent of world output. Sales amounted to 7470 t U valued at $375 million in 1993. Uranium production and sales in 1994 should exceed those of 1993.

Reserves and production figures for the three main mines are presented in Table 2. Currently identified reserves within the Athabasca Basin are sufficient to sustain production well into the next century. On the exploration side, some ten companies make up current uranium exploration joint ventures. Exploration in all parts of the Athabasca Basin is aimed at the discovery of another major deposit of the Key Lake–Cigar Lake unconformity-type although, as usual, it is concentrated in the east and southeast part. Mineralized holes are common in this area where programs may test unconformity targets at depths exceeding 500 m. The area still holds great potential, especially at these depths; although funds for a major exploration effort are not available due to the low price of uranium and the excellent reserve position. The uranium industry in northern Saskatchewan is in a development phase.

Rabbit Lake

Cameco, operator (66.7%); Uranerz Exploration and Mining Ltd. (33.3%)

The Rabbit Lake mill continued to operate on a one-week-up/one-week-down schedule in 1993. Production in that year rose seven percent to 2300 t U and is expected to rise another 20 percent in 1994, on the same schedule. The B zone stockpile and Eagle test mine ore has provided mill feed pending federal government approval for full production at Eagle Point, received in March 1994, and the start up of full production in mid-year.

Non-entry stope test mining of the Eagle Point 02 zone, which began in 1992, expanded in 1993 with the mining of a second and third stope and development of a fourth stope in the 144 zone. At the end of 1993, about four percent of Eagle Point reserves were in stockpile. Cameco has evaluated a number of different mining methods appropriate for this deposit. A 1993 mill test of Eagle Point ore yielded excellent recoveries with significant reduction in the consumption of reagents. Further test milling of Eagle Point ore was planned for early 1994 to confirm mined ore grades and optimize mill operating parameters.

The joint venture also has contingent approval to develop the Collins Bay D and A zones as open pits and plans to mine during the winters of 1995-96 and 1996-97, respectively. To do this, dykes must be constructed around the two orebodies to isolate water in Collins Bay from the mine sites. D zone dyke construction started during the fall of 1994. Ore from Eagle Point and the proposed open pits will provide mill feed for the next

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Table 2 - Published reserves from Saskatchewan uranium mines.

Owner(s)*	Property/Deposit	Reserves(t U) (Unstandardized)	Grade %U	Production (t U) 1993***	1994****
	MINEABLE**				
Cameco–Uranerz Expl. Mining	Rabbit Lake			2313*****	2800
	Collins Bay B	1 655	0.5	-	-
	Collins A	6 500	4.82	-	-
	Collins D	2 200	1.86	-	-
	Eagle Point	16 400	1.16	-	-
Cameco–Uranerz Expl. Mining	Key Lake				
	Deilmann	29 800	1.46	5315	5300
Cogema–Corona Grande Exp.	Cluff Lake	14 000	0.72	867	1040
Minatco–Tenwest–OURD	McClean, JEB, and Sue Trend	19 300	2.78	-	-
Minatco–Tenwest–Uranerz Expl. Mining–OURD	'Midwest' Lake	13 800	3.7	-	-
	GEOLOGICAL**				
Cameco–Uranerz Expl. Mining	Eagle Point	9 300	0.9	-	-
Cameco–Cogema–PNC–Kepco	Dawn Lake	11 500	1.67	-	-
Cameco–Uranerz Expl. Mining–Interur. Can.–Cogema	McArthur River P2N	100 000	4-5	-	-
Cigar Lake Mining (Cameco–Cogema–Idemitsu–Kepco)	Cigar Lake	148 000	7.84	-	-

Notes:
* Operator first.
** 'Mineable' and 'Geological' are Cameco definitions. All figures in the table may not be exactly comparable.
*** 1993 production figures from Cameco annual report in those cases where Cameco controls the deposit.
**** 1994 production estimated.
***** Rabbit Lake mill used ore from the Eagle 02 zone and the Collins B stockpile.

decade. Since production began in 1975, the Rabbit Lake and Collins Bay B zone open pits have been mined out, producing more than 30 800 t U.

Cluff Lake

Cogema Resources Inc., operator (80%); Corona Grande Exploration Corp. (20%)

At Cluff Lake, 1993 production was 867 t U from the Dominique–Peter underground mine. An estimated output of 1040 t U is expected in 1994 from a combination of ore derived from the Dominique–Peter and Dominique–Janine extension. The joint venture expects to be able to mine year-round in 1995.

The Cluff Lake partnership has received government approval to extend its open pit mining operation at Cluff Lake. Extraction of ore from the Dominique–Janine North orebody began in early 1989, and was completed by the end of December 1991. Exploration drilling indicated that the zone of mineralization extended continuously southward from the open pit to the edge of Cluff Lake. While the government environmental review process was proceeding, new methods were being evaluated to mine the ore pods located below the shoreline of Cluff Lake. A modified project, separated into three phases of mining, is now to be implemented beginning this year. Firstly, the Dominique–Janine Extension Part 1 open pit will proceed as originally proposed; secondly, an underground mine utilizing a decline plus an undercut and fill mining method will extract the ore to the south of and below the open pit; and thirdly, jet boring and/or blind boring from surface proximal to the lake will mine the ore pods located near the unconformity between the basement and the Athabasca Group sandstones. These methods no longer require that a dam be constructed into Cluff Lake and all waste rock from the modified project can now be disposed into the mined out Dominique–Janine and Claude pits. The three-stage process will mine a total of 683 500 t, grading 0.73 percent U containing 5018 t U.

In the Dominique–Peter mine, development and some stoping continued in 1993 on two levels in the Dominique–Peter Center and North areas. In the Dominique–Peter Center, conventional stoping methods are being employed, while in the North an Alpine continuous miner is being utilized to mine a low angle, westerly dipping ore structure. Surface exploration drill programs again followed up the positive results in old drilling close to the Dominique–Peter and Dominique–Janine mines.

Key Lake

Cameco, operator (66.67%); Uranerz Exploration and Mining Ltd. (33.33%)

Key Lake, where the Deilmann open pit is being mined, is the largest high-grade uranium deposit in the world. Production was 5315 t U in 1993, about three percent lower than in 1992, as a result of a decision to process lower grade ore. The average mill head grade decreased to 1.88 percent U in 1993 from 2.1 percent in 1992, however, throughput was increased. The Key Lake mill can continue to produce the targeted 5385 t U per year through to 1998, when the average grade of the ore remaining on the stockpile will be too low to achieve this production rate. Future feed to the Key Lake mill is tentatively scheduled from the McArthur River uranium deposit, which should double the life of the Key Lake facilities. In conjunction, the Deilmann pit will be used as a "pervious" surround tailings disposal facility similar to that in use at Rabbit Lake. Government approval of these plans will be required.

Cigar Lake

Cigar Lake Mining Corporation: Cameco Resources Ltd. (48.75%); Cogema Resources Inc. (36.375%); Idemitsu Uranium Exploration Canada (12.875%); and Korea Electric Power Corporation (2.0%)

The Cigar Lake Mining Corporation is developing the Cigar Lake deposit, with reserves estimated at 148 000 t U. At present, development consists of a shaft to 500 m and two levels: one at 420 m, above the orebody in the Athabasca Group sandstones; and the other at 480 m, below the orebody in the basement rocks. Boxhole boring and jet-boring mining tests were successfully carried out in 1991 and 1992. Since the completion of the technical phase of the project evaluation in April 1993, the site has operated on a care and maintenance basis.

During this time, Cigar Lake Mining Corporation has completed the feasibility study for the project and continues to prepare an EIS scheduled for submission in early 1995. Assuming government approval, construction would take place in 1996-97 and production in 1998. The feasibility of using an existing mill and tailings facility as an alternative to building a new plant is being evaluated.

Midwest Property

Midwest Joint Venture: Minatco Ltd. (56%); Tenwest Uranium Ltd. (19.5%); Uranerz Exploration and Mining Ltd. (20%); and OURD (Canada) Co. Ltd. (4.5%)

Although the Midwest mining project, as described in the 1991 EIS, failed to receive government's approval, Cogema Resources Inc., the new majority owner and joint venture operator, still plans to develop the McClean and Midwest properties in a complementary manner. Accordingly, Cogema Resources Inc. will rethink the Midwest project especially with regard to mining method and plans to submit a new EIS in 1994. The program proposed for complementary operation is outlined below.

McClean Lake Property

Minatco Ltd. (70%); Denison Mines Ltd. (22.5%); and OURD (Canada) Co. Ltd. (7.5%)

In contrast to Midwest, the McClean Lake project can proceed immediately irrespective of the Federal-Provincial review panel recommendation for a delay in start up of at least five years. The joint venture plans to begin mining the JEB deposit by open pit by the fall of 1995. Following a commissioning period, the mill should operate at 2300 t U/year until 2008. Mining of the JEB will commence two years before and be completed when commercial production begins so that the JEB pit can be used for tailings disposal. Mining will continue with the SUE C open pit followed by the SUE A and B open pits and eventually the McClean Lake underground deposit. Approval and successful development of the Midwest orebody will add six years to the life of the operation for a total of 14 years assuming no further reserves are found. Published reserves are 19 300 t U averaging 2.78 percent U on the McClean Lake property and 13 800 t U on the Midwest property.

Exploration has continued along the SUE trend with the objective of identifying additional high-grade open pit reserves. The SUE A, B, C, and CQ deposits are clustered on the western edge of the presumed Archean Collins Bay 'dome' within a 2.9 km long northerly trending zone. The SUE A and B deposits are hosted by altered Athabasca Group sandstones at and above the basement unconformity. The SUE C and CQ deposits occur in Aphebian Wollaston Group basement rocks flanking the 'dome' at depths of 70 to 180 m below surface. The deposits are located within a zone of faulting and alteration. In the SUE A and B deposits, uranium oxides and silicates are associated with Ni-Co arsenides and Fe-Ni-Co-Cu sulphides. The SUE C and CQ deposits consist mainly of uranium oxides. The SUE A and B deposits were discovered by drilling conductive zones delineated by ground VLF and HLEM (MaxMin) techniques. The SUE C and CQ deposits were identified by drilling DC resistivity and IP anomalies located 100 m away from the MaxMin conductor axis.

McArthur River–P2 North

Cameco and its subsidiary Cameco Resources Ltd., operator (53.991%)(56.435%); Uranerz Exploration and Mining Ltd. (29.775%)(27.331%)*; Interuranium Canada Ltd. (9.063%); and Cogema Resources Inc. (7.171%) ( )* These figures are ownership at production.*

The McArthur River uranium project is proceeding with an underground exploration program to properly define the orebody's limits, form, and reserves. An EIS covering all aspects of mine design, and the effects of full-scale production, will be submitted at the end of the exploration phase expected in the first quarter of 1995. The site has a temporary camp, airstrip, offices, water treatment plant, and is connected to the SaskPower grid. Particularly favorable features of this deposit, based on surface exploration drill data, are: size, grade, and good mining conditions. Its location, only 70 km northeast of Key Lake, and the ore composition, which

is suitable for treatment at the Key Lake mill, are other attractive parameters. The shaft is now complete to the 550 m level and a 530 m level is being developed in the basement underlying the Athabasca Group sandstones. A crosscut to grid west at this level will be followed by an exploration drift parallel to the orebody. Starting mid-October, 25 000 m of drilling will be carried out from this crosscut to properly define 400 m of the orebody.

A 500 tpd production mine with a projected capital cost of $100 million, is planned for the late 1990s. To meet the production schedule, an EIS must be submitted and government approvals obtained. An all-weather access road must be built to Key Lake and mine development must take place in 1996-97. Geological reserves are estimated to be approximately 100 000 t U grading 4 to 5 percent U. Anticipated mine life is approximately 20 years. These figures make McArthur River reserves 50 percent greater than Key Lake's at more than double the grade.

GOLD

Gold, like uranium, is in a development phase. Exploration, focused in the La Ronge and Glennie Lake domains, is being undertaken by less than ten companies compared to over 60 in 1988. Greater Lenora Resources Corporation is active again on the Box and Athona mine properties south of Uranium City. A Cameco Corporation operated joint venture will put the Contact Lake mine into production, Claude Resources Inc. continues to operate their Seabee mine successfully, and Waddy Lake Resources Inc. expects to be in full production at the Komis deposit sometime in the first half of 1995. These mines will hopefully illustrate the opportunities for gold exploration in the province.

La Ronge Domain

Contact Lake

Cameco, operator (66.67%); Uranerz Exploration and Mining Ltd. (33.33%)

The decision to put the Contact Lake property into commercial production followed the completion of a $4.5 million test mining program. Total project costs are estimated at $38 million. Construction, costing about $33 million, will include access road improvements, a 700 tpd mill, a water treatment facility, and an expanded 80 person camp. Work began in April and will take 12 months to complete. Production will start in late 1994 or early 1995.

The Contact Lake mine contains mineable reserves of 1.3 million tonnes averaging 8.0 g/t (0.23 oz/ton) Au, about 338,000 ozs of gold (Table 3). In addition, some 336,000 ozs of gold in geological reserves have been identified at or near Contact Lake. In September, the property was developed on four levels from a decline which had reached the 5290 level or 160 m vertically below surface. The mine, potentially the largest in Saskatchewan's history, has an estimated life of six years. Additional geological reserves and ongoing exploration may extend this period.

Byers Fault Area: Komis Deposit

Waddy Lake Resources Inc. (operator) 100%

Waddy Lake Resources Inc., a 55 percent owned subsidiary of Golden Rule Resources Ltd., completed its underground test mining and milling programs on its 100 percent owned Komis property. Due to the "nugget" character of the gold mineralization making up the deposit, the programs were designed to determine the continuity and grade consistency of the ore zones. A 9100 t bulk sample was extracted from two levels along the A, C, and E ore zones. It was subsequently hauled to and tested at the Jolu mill 75 km south of Komis to provide comparative assay data on a round by round basis. The bulk sample yielded a 291.3 kg table gold concentrate and a 32 t gold-pyrite concentrate.

Results of the test programs were positive. Geological interpretation and structural modeling of the ore zones making up the deposit are consistent with the original interpretation. The underground work indicates that the orebody is open and extends to the west and downplunge where it is undrilled. The ore zones tested also become better with depth; quartz vein size, pyritization, and gold content all increased to the 300 m level. Consistency and grade of the gold mineralization making up the ore zones tested compared favorably with the mill sampling results. High free gold recoveries were made by using gravity and flotation separation processes. This information will be the basis for determining final plant design.

A "global reserve" including all 12 of the property's gold zones was calculated at 405 500 t grading 12.42 g/t (0.362 oz/ton) Au (uncut and undiluted), and a "Phase One" mineable reserve at 223 000 t grading 12.45 g/t (0.363 oz/ton) Au (diluted to 17.5 percent) to the 300 m level (130 m vertical) based on the ore zones A, C, and E which were tested. Both ore reserves are considered preliminary. The present mine plan contemplates a 400 tpd mining operation with initial production from two large blast hole stopes (C and E zones) and one shrinkage stope (A zone).

The company is carrying out a 6300 m, two rig diamond drill program designed to double the probable reserves on the deposit prior to full production which is estimated to begin in the first or second quarter of 1995. Waddy Lake Resources Inc. is preparing an EIS for submission to the provincial government. Engineering work has begun on the site, mine development plan, Jolu mill plant, and on the 40 km haulage road to be constructed from the Komis mine site to the Jolu mill.

The Komis is the first of eight advanced Golden Rule held properties in this area to be tested underground. The other seven deposits are Tower East, Golden Heart, Weedy B zone, Niko, Corner Lake, EP, and Twin. Table 3 lists published reserves for these deposits.

Other La Ronge Domain Prospects

Uranerz Exploration and Mining Ltd. continued their grassroots exploration program, including taking an op-

tion on the "Broken Hammer" property of Alligator Resources Ltd. Kristo Gold Inc. processed 100 barrels of concentrate each weighing about 0.5 t from their 1992 Anglo Rouyn mine pilot plant but the results are not yet available. Durama Enterprises Ltd. is preparing a final EIS for their proposed plan to mine and mill several thousand tonnes from the first 10 m of the gold zones at Pap Southwest. This company continues to prospect, till sample, geologically map, and drill their properties to the north and west of Highway 102 in the Contact Lake mine area. Highrock Contracting Ltd. and Ted Kennedy and Associates Ltd. prospected, till sampled, and ran

Table 3 - Published production and reserves from selected Saskatchewan gold properties.

Owner(s)*	Property	Reserves (t) or Production (t)	Grade g/t	Grade oz/shrt ton
	MINED OR MINED TO DATE			
Cameco–Starrex Uranerz Expl. Mining	Star Lake Mine 21+Rush zones**	76 947 ozs 180 291	14.7	0.43
Cameco–Shore Gold	Jasper Mine**	82 697 ozs 140 127	18.8	0.55
Corona Corp.– Int. Mahogany Corp.	Jolu Mine Rod+Mallard**	203 751 ozs*** 472 220	14.4	0.42
Greater Lenora Res. Corp.	Box	64 066 ozs 1 286 672	1.55	0.045
Claude Res. Inc.	Seabee	152 648 ozs 473 069	10.7	0.31
	MINEABLE			
Cameco–Uranerz Expl. Mining	Contact Lake	1 313 000	8.01	0.23
Claude Res. Inc.	Seabee	445 000****	10.45	0.31*****
Waddy Lake Res.	Komis	223 000	12.45	0.36
	GEOLOGICAL			
Cameco–Uranerz Expl. Mining	Contact Lake	573 000	10.5****	0.31
Cameco–Uranerz Expl. Mining	Pap SW	365 000	12.1	0.35
Claude Res. Inc.	Seabee	429 000*****	10-11*****	0.29-0.32
Golden Rule Res.	Corner Lake	181 000	13.0	0.38
Golden Rule Res.	Niko	85 700	6.2	0.18
Golden Rule Res.–Int. Mahogany Corp.– Comaplex Res.	Tower East	922 000	6.9	0.2
Greater Lenora Res. Corp.	Athona Box Mine	4 500 000 22 673 000	1.9 1.85	0.06 0.05
Radcliffe Res. Inc.	"North" Lake	2 360 000	2.4	0.07
Royal Oak–Golden Rule Res.–Cameco	Twin	351 100	6.2	0.18
Tyler Res.–Golden Rule Res.–Cameco	Weedy B Golden Heart	314 000 687 000	4.8 10.3	0.14 0.3
Waddy Lake Res.	EP Komis	227 000 405 500	5.8 12.4	0.17 0.36

Notes:
* Operator first.
** Mined out.
*** Additional 1500 ozs estimated recovered during clean up.
**** Proven and probable reserves.
***** Approximate grade only.

geophysical surveys on their Upises Lake property. Recently, Canadian Mining Resources Inc. optioned a 1944 ha property from Leeward Capital Corp. in the Lynx Lake area. A sample from a one metre wide quartz vein adjacent to a shear zone yielded 19.21 g/t (0.56 oz/ton) Au. The property is reported to be in part underlain by the Contact Lake Pluton, in which the shear zone hosted Contact Lake gold mine is located. Golden Band Resources Inc. undertook a bulk till sampling program on properties in the Waddy Lake area and utilized an innovative new process involving a Knelson concentrator to process the samples on site.

Glennie Lake Domain

Seabee Mine

Claude Resources Inc. (100%)

In 1993, the Seabee mine broke 191 899 t of ore grading 10.10 g/t (0.3 oz/ton) Au and milled 172 024 t of ore grading 11.1 g/t (0.32 oz/ton) Au (grades cut to 50 g/t (1.46 oz/ton) Au). Production was 57,582 ozs of gold principally from zone 2.

Production for the first six months of 1994, derived from zones 2 and 5, was 23,900 ozs, some 4,062 ozs less than for the same period in 1993. These figures reflect lower grades while mine development work was undertaken to bring on-stream more high-grade work faces. The company is optimistic that its production target of 54,000 ozs Au will be achieved by year end. From November 1991 to August 31, 1994, 473 069 t of ore yielding 152,648 ozs of gold have been processed.

The current proven and probable reserves on the property are 445 000 t at an estimated average grade of 10 to 11 g/t (0.29 to 0.32 oz/ton) Au. These reserves, together with an additional 429 000 t of drill, indicated ore at similar grade and the 473 000 t of ore processed to date yield a total reserve of 1 375 000 t. Further increases in all categories of reserves are expected as development and drill programs continue.

The deposit is structurally controlled in near-vertical ductile shear zones which cut the medium- to coarse-grained, leucocratic to melanocratic, Laonil Lake metagabbro. Gold occurs in association with quartz veining and sulphide mineralization and the highest grades are found where the shears splay or branch. Ore zones within the shears range in thickness from 1.8 to 5 m. Visible gold is common, occurring with pyrite, minor chalcopyrite, and pyrrhotite.

The company has an agreement with Currie Rose Inc. to explore and develop the 4460 ha property surrounding the Seabee mine. Exploration work indicates that the gold-bearing shear zones, which host the Seabee deposit, continue onto the Currie Rose lands. In 1994, drilling extended Seabee zone 2 to the western boundary of Claude's property.

Other Glennie Lake Domain Prospects

In the southeastern Glennie Domain, a Consolidated Pine Channel Gold Corp.–Tukto Development Corp. Prongua Lake joint venture drilled the Versary zone discovered by prospecting in 1993 in the Wood Lake area. The company reported that, in the first four holes drilled on the sulphide-bearing, quartz-tourmaline breccia vein system, gold mineralization was traced over a length of 400 m with gold values of 12.69 g/t (0.37 oz/ton) Au over 2.3 m or 10.29 g/t (0.30 oz/ton) Au over 3.4 m. A 20 hole, 3000 m drill program will start as soon as weather conditions permit.

Western Craton

Greater Lenora Resources Corporation, 100 percent owner of the Goldfields Project consisting of the Box and Athona open pit prospects on the north shore of Lake Athabasca, is active in the province again. A diamond drill program, designed to upgrade the level of confidence in existing reserves and test for mineralization at depth was carried out. Up to the end of September 1994, Lenora had drilled 52 holes on the Box property and 51 on the Athona property.

Twenty-four of the holes on the Box were in the area of the old underground workings. The remaining tested the "Mine Unit" at depth, with half at or below the 120 m (ASL) elevation. The new drilling suggests that quartz veining with sulphide (and gold) mineralization increases with depth.

The holes at Athona were in the area of the prospective open pit, as well as some exploration away from the "Main Zone".

Metallic assaying of total core was carried out. Lenora has released uncut gold values as they represent the total contained gold. Assays published from the Box drilling show good values and widths.

Assays from the summer program on the Box open pit property are almost complete, while those on the adjacent Athona open pit property will be completed by late November. Reserve compilations in terms of geological and mining reserves and grades are well underway. Full section and bench plans are being prepared for each of the Box and Athona properties with preliminary pit design, process confirmation, and economic evaluation being carried out prior to the full feasibility study which is expected to begin in mid-January.

BASE METALS

Base metal exploration programs were undertaken in: the Wollaston, Kisseynew, and Flin Flon domains; the Hanson Lake Block; and the sub-Phanerozoic area south and west of Flin Flon.

Noranda Exploration Co. Ltd.'s program in the Wollaston Domain focussed on delineating sediment-hosted stratiform base metal deposits in the Pendleton-Sito-Duddridge lakes areas. Granges Inc., Cominco Ltd., Noranda Exploration Co. Ltd., BHP Minerals Canada Ltd., and Hudson Bay Exploration & Development Company Limited continued their efforts to locate volcanogenic massive sulphide deposits in the Flin Flon and Kisseynew domains and in the sub-Phanerozoic area.

M.I.M. Holdings, Granges Inc.'s Australian-based parent, sold their 37.2 percent interest in the company to Atlas Corp. With this sale, it is expected that Granges Inc. will expand their predominantly base metal exploration portfolio to include a greater proportion of gold prospects. Granges Inc. recently sold their interest in the Trout Lake Cu-Zn Mine in Manitoba to Hudson Bay Mining and Smelting Co., Limited.

Flin Flon Domain–Hanson Lake Block

Callinan Mine

Hudson Bay Mining and Smelting Co., Limited (100% subject to 6.67% NPI with Consolidated Callinan Flin Flon Mines Ltd.)

Mining of the Callinan copper-zinc deposit continued in 1993-94 with production from the Callinan South, East, and lower portions of the North zones. All production to date has come from the Manitoba portion of the deposit. From April 1, 1990 to September 30, 1994, the mine produced 1 900 434 t grading 1.45 percent Cu, 3.8 percent Zn, 2.05 g/t (0.060 oz/ton) Au, and 24 g/t (0.70 oz/ton) Ag. The focus of production shifted in 1993-94 from the South to the East zone. In future years, production will move from the East to the North zone. Development of the South zone has been completed to the 960 m level, with current production from the 950 m level. The small reserve remaining in the South zone is to be mined next year, along with recovery of pillars. Most of the 1993-94 production was from the East zone with development proceeding to the 990 m level. The North zone, which contains substantial tonnage and which straddles the provincial boundary, is currently in the development stage. Exploration downplunge of the ore lenses is ongoing. As of January 1994, proven mineable reserves (<30 m drill spacing) from all three zones were 2 000 000 t grading 1.53 percent Cu, 3.4 percent Zn, 2.3 g/t (0.068 oz/ton) Au, and 26 g/t (0.76 oz/ton) Ag and probable reserves (30 to 60 m drill spacing) were 1 540 000 t grading 1.49 percent Cu, 3.5 percent Zn, 2.4 g/t (0.071 oz/ton) Au, and 26.5 g/t (0.77 oz/ton) Ag. In the Upper Callinan North zone, which lies predominantly within Saskatchewan, geological reserves are reported at 562 000 t grading 1.71 percent Cu, 4.1 percent Zn, 2.0 g/t (0.057 oz/ton) Au, and 22.64 g/t (0.66 oz/ton) Ag.

Exploration activity in the Flin Flon area has increased markedly this year, particularly in the Denare Beach area where Hudson Bay Exploration & Development Company Limited has aggressively acquired an expanded land position through staking activity and option agreements with other disposition holders. The increased activity is in response to encouraging results obtained by Hudson Bay Exploration & Development Company Limited from drilling mafic volcanics. Previous massive sulphide deposits in the area include the mafic volcanic-hosted, copper-dominant, Birch, Flexar, and Coronation mines. Hudson Bay Exploration & Development Company Limited has also acquired additional land holdings in the Neagle, Matheson (FON zone), and Wildnest Lake areas.

Sub-Phanerozoic Area

Cominco Ltd., Granges Inc., and Hudson Bay Exploration & Development Company Limited all continued exploration programs under the Phanerozoic cover.

Table 4 - Published reserves from Saskatchewan base metal properties.

Owner(s)* Venture Operator	Property	Reserves (t) or Production (t)	Grade Cu %	Zn %	Pb %	Au g/t	Ag g/t
	MINEABLE						
Cameco–Billiton Met. Can.	McIlvenna Bay	13 100 000	1.26	4.95	-	0.5	24.3
HBM+S	Callinan East, South, Lower North						
	Proven**	2 000 000	1.53	3.4	-	2.3	26.0
	Probable***	1 540 000	1.49	3.5	-	2.4	26.5
	Production	1 900 000	1.45	3.8	-	2.1	24.0
	GEOLOGICAL						
Granges Ex.– Cameco	Bigstone Lake	1 451 000	2.9	-	-	-	-
		308 000	-	11.2	-	-	-
HBM+S	Callinan North**** (Sask.)	562 000	1.7	4.1	-	2.0	22.6
Longyear option to Phelps Dodge	Brabant	3 500 000	0.54	4.5	0.24	0.2	17.2

Notes:
* Operator first.
** <30 m drill spacing.
*** 30 to 60 m drill spacing.
**** Geological resources.

Cominco Ltd. conducted geophysical and drill programs on both the Mossy River and Suggi Lake areas in an ongoing search for volcanogenic massive sulphide (VMS) type deposits. Further west, on the Bigstone Lake property, a Granges Inc. (operator)–Cameco Corp. joint venture carried out a gravity survey and a minor drill program.

At McIlvenna Bay, the Cameco Corp. (operator)–Billiton Metals Canada Inc. joint venture was inactive again this year. A reevaluation of drill results in 1993 produced revised geological reserves of 13 100 000 t of 1.26 percent Cu, 4.95 percent Zn, 0.52 g/t (0.015 oz/ton) Au, and 24.3 g/t (0.71 oz/ton) Ag.

Kisseynew Domain

BHP Minerals Canada Ltd., Cominco Ltd., and Noranda Exploration Co. Ltd. undertook exploration programs. BHP Minerals Canada Ltd. and Cominco Ltd. both carried out geophysical and drill programs on their respective Kakinagimak and Judique lakes properties. Noranda Exploration Co. Ltd. completed a mapping program in the Ukoop Lake area after reviewing assessment file data that described a package of rocks which could be a metamorphosed, altered, volcanic sequence.

Wollaston Domain

Noranda Exploration Co. Ltd. continued their efforts to locate stratiform, sediment-hosted base metal deposits in the Wollaston Domain. Geophysical and drill programs were carried out in the first quarter of 1994 in the Pendleton, Sito, Fannon, and Duddridge lakes areas to follow up an encouraging 1993 drill program which had intersected low grade Cu and Pb-Zn mineralization over significant widths. Noranda has been inactive on this play since the new 1994 drilling, leaving a number of discoveries not fully tested. In addition, two new copper prospects have been identified in the Janice Lake area as a result of a summer mapping program by Saskatchewan Energy and Mines. Noranda also optioned the George Lake property from Falconbridge and completed a small drill program. In the Campbell River Belt, Cominco carried out mapping and soil sampling.

DIAMONDS

Reports from the Slave Province in the Northwest Territories and the War Eagle Mining Co. Ltd.–Great Western Gold Corp. discoveries in Saskatchewan continued to lend impetus to the province's diamond exploration boom. Lands under disposition for diamond exploration on October 1, 1994 amounted to some 4 000 000 ha, or seven times the area of two years ago. Most of the properties are in an area running across the province between latitudes 53° and 56° which includes: Fort-à-la-Corne; the Pasquia Hills; the Molanosa Arch; and Candle, Sturgeon, Smoothstone, and Wapawekka lakes. In early 1994, the War Eagle Mining Co. Ltd. and Great Western Gold Corp. joint venture drilled five diamondiferous kimberlite pipes at two locations in the Candle and Whiteswan lakes area. These finds represent a northerly extension of the Fort-à-la-Corne kimberlite field.

At the end of 1993, the Fort-à-la-Corne diamond project was owned by Uranerz Exploration and Mining Ltd., operator (33.33%), Cameco Corporation (33.33%) and Monopros Ltd. (33.33%). The Fort-à-la-Corne kimberlites comprise at least 70 magnetically defined bodies, up to 100 ha in size and probably constitute the largest known kimberlite province in the world. Since 1988, one main kimberlite cluster, some 10 km by 50 km in size, and two subclusters have been outlined by magnetometer surveys in an area where overburden thicknesses range from 80 to 158 m. The bodies, mostly crater-facies Group 1 kimberlites, formed as subaerial volcanoes with shallow craters which are usually less than 1300 m in diameter. Development of the craters seems to have been confined to, and influenced by, the 200 m of poorly consolidated Cretaceous fine-grained sediments which overlie the indurated Paleozoic carbonates. Diatreme or root zones have not yet been identified. At the end of the 1992 program, 25 kimberlites had been identified by drilling. The 1992 exploration drill program produced 138 macrodiamonds with a total weight of 7.61 carats, recovered from samples of 131.7 t total weight taken from three kimberlite bodies. The largest stone recovered that year weighed 0.985 carats. The 1993 exploration drilling program included 34 holes in 18 kimberlite bodies. A total of 2.34 carats (63 macrodiamonds, each greater than 1 mm in size, which was the lowest cut-off size used in the recovery of these diamonds) was recovered from 243 t of samples. The largest macrodiamond recovered weighed 0.41 carats. Estimated grades for individual drill holes in 1993 range up to a maximum of 9.2 carats per one hundred tonnes (cpht). Based on macrodiamond recoveries to date, these grades are not economic, although it should be noted that the results are based on limited exploration sampling which is not statistically representative and does not take into account the quality or value of the stones. Because a large number of targets remained untested by drilling, the joint venture continued their exploration drilling program in 1994. The results of the reconnaissance scale, large diameter, drill hole, sampling program are not expected until late 1994.

At the end of 1993, Rhonda Mining Corp. held varying interests in over 1.3 million hectares, through joint ventures with 14 junior mining companies in the Sturgeon Lake, Fort-à-la-Corne, and Carrot River areas of central Saskatchewan. These joint venture partners form the largest group of landholders in the diamond exploration play. Rhonda Mining Corp. bases its exploration on the hypothesis that Cretaceous stratigraphic sequences in the region contain totally preserved kimberlite complexes. A low-level, high-resolution, airborne magnetic survey covering 245 250 ha and 12 drill holes were completed last year, for total 1993 expenditures of $2 million.

Based on an analysis of the airborne and ground magnetic survey data which was completed in August 1994, 81 000 ha of priority lands were identified on which exploratory drilling will be focused. Subject to the rights of its partners Rhonda is proposing to return approxi-

mately 728 500 ha to the crown or former owners. The corporation holds various participating and carried interests in a further 405 000 ha operated by third parties. Rhonda's diamond targets have been identified as volcanic tuff rings and sedimentary units associated with diatremes occurring on or in the vicinity of the Uranerz-Cameco-Monopros joint venture lands. Exploration drilling will focus on 14 potentially diamond enriched, volcaniclastic sedimentary targets. Diamonds and or diamond indicator minerals are reported from four separate kimberlitic sandstone units within a 50 m thick sequence of middle Cretaceous sediments on property at Fort-à-la-Corne. The property is optioned by Kensington Resources Ltd. from Rhonda Mining and Kimmswick Diamonds Inc., a subsidiary of Aaron Oil Corp. Kensington also reported three similar laterally extensive, kimberlite horizons in the Foxford area. At Snowden, a 4 to 9 m thick apron of water-laid volcanics has been identified by Rhonda Mining Corp. These kimberlitic volcaniclastic aprons, surrounding the Uranerz-Cameco-Monopros volcanic centers, are reported to be both weakly and strongly magnetic depending on the degree of carbonatization or serpentine-magnetic alteration. Rhonda Mining Corp. selected their property after interpretation designed to find large scale ring features that would reflect volcanoes and possible collapse structures.

A small portion of the Snowden property, located some 3 km southeast of the community, is a joint venture owned by Rhonda Mining Corporation (operator) (45%), Aaron Oil Corporation (45%), and Lucky Break Gold Inc. (10%). In February 1994, the joint venture reported recovery of 20 diamonds including one deep yellow, a colorless clear macrodiamond, and two champagne micros from mid-Cretaceous kimberlite volcanics intersected in DDH's 93-2, -3, and -4, 100 m below surface. The highest diamond concentrations are in the middle and upper reworked tuffs particularly the well-bedded sections which overlie a basal dark green massive unit. A further hole, DDH.OFS 94-17, drilled 1 km east of the 93 drill holes, cut a 10.6 m section below 110 m containing several thin sandstone and sandy mudstone beds containing minor amounts of diamond indicator minerals. The company describes clear evidence of sorting and concentration of heavy minerals by wave action acting on primary ejected kimberlite. Research is continuing at Leeds University, England on all sample material, but particularly on the G-10 garnets, heavy minerals, and petrology of the kimberlites.

As of November 1, 1993, War Eagle Mining Company Inc. (50%) and Great Western Gold Corp. (50%) formed the Candle Lake joint venture to explore for diamonds. Initially the partners planned to drill ten magnetic targets, out of a total of 90 selected from more than 150 anomalies. Seven holes led to the discovery of five diamondiferous pipes occurring in two locations some 32.5 km apart in the Candle and Whiteswan lakes area. Hole #2 intersected kimberlite at the southern location while holes #3, #4, #5, and #6 hit at the northern. Table 5 summarizes the results to date from quartered drill core.

The gem quality of the diamonds and high degree of diamond preservation indicate a significant discovery. Electron microprobe analyses conducted on samples obtained from all of the pipes shows a large number of G-10 garnets, which suggests that the pipes could be highly diamondiferous. This is especially significant for Pipes 30A, 30B, and 30C which, as a cluster group, have a large tonnage potential. The compositions of picroilmenites and chromites also suggest conditions suitable for excellent diamond preservation and formation.

The Candle Lake joint venture has increased its land position to 417 claims covering 317 297 ha. The additional claims are located within a specific area of the Candle Lake magnetic low trend which hosts all the known pipes and is prospective for further discoveries. In April, the joint venture had recently completed an additional 42 500 line km, low-level airborne magnetometer survey to further evaluate the trend. The survey has now covered 67 000 line km in total. Discussions with major mining companies to further evaluate the five pipes and continue exploring the Candle Lake trend, are ongoing, but a joint venture has not yet been formed.

Consolidated Pine Channel Gold Corp. and its joint venture partners drilled airborne magnetic targets which had been ground checked in the Molanosa Arch, Tobin, and Montreal lakes areas, without success, and Kensington Resources Ltd. drilled targets in the Candle Lake and Fort-à-la-Corne discovery areas. At least ten separate ventures have undertaken or intend to carry out airborne magnetic surveys. For example, Pure Gold Resources Inc. plans a $600,000 program of airborne and ground surveys on more than 364 000 optioned hectares and the Saskatchewan Diamond Syndicate, jointly owned in varying percentages by Swannell Minerals Corp. (operator), Golden News Resources Inc., Calco Resources Inc., and Guardian Resources, completed a 20 600 line km low-level airborne magnetic survey covering property

Table 5 - Published results from the Candle Lake joint venture.

Pipe Number	Pipe Size (ha)	Sample Size (kg)	Diamonds Recovered (>0.5 mm)	Macro-diamonds (>0.5 mm)	Octahedral diamonds
28	30	23.4	2	0	1
29	20	64.9	17	4	5
30A		46.6	8	0	3
30B	61*	79.3	7	0	2
30C		17.5	6	1	2
Totals	111	231.7	40	5 (12.5%)	13 (33%)

Note: *Pipes 30A, B, and C are closely spaced with a combined area of 61 ha.
38 diamonds or 95% are clear white gem quality.

totaling 364 230 ha in the Candle Lake, Fort-à-la-Corne, and Carrot River areas. At present it is uncertain how many of these joint ventures will drill test their properties.

Exploration activity on the diamond plays in the south-central and southwest areas of the province continues, albeit at a much lower level of intensity than that centered on Fort-à-la-Corne. The widespread occurrence of kimberlite indicator minerals in surficial deposits in this region is well known, although discoveries of kimberlite bodies have yet to be made. Most of the work performed this year consisted of ground follow-up of aeromagnetic anomalies. At the time of writing, drill testing of several "Willows Project", magnetic anomalies is taking place by the Lumina Investment Corporation, Super Twins Resources Ltd., and Diamond Fields Resources consortium. Better Resources, Silver Standard Resources, Kensington Resources Ltd., and Winslow Gold Corp. are some of the other larger land holders in this area.

Phanerozoic

In March 1993, Focal Resources Ltd. announced an agreement with HMS Properties Ltd., whereby Focal would provide funding to explore and develop "a large deposit of Devonian limestone with high silica and high values of gold and platinum group elements" located on HMS's metallic mineral lease in the Fort McKay area of northeast Alberta. Surface samples collected by Focal Resources Ltd. prior to drilling returned values of up to 68.6 g/t (2 oz/ton) Au, 40.82 g/t (1.19 oz/ton) Pt, 44.59 g/t (1.3 oz/ton) Rh, 152.98 g/t (4.46 oz/ton) Os, 128.28 g/t (3.74 oz/ton) Ru, 5.83 g/t (0.17 oz/ton) Pd, and 359.81 g/t (10.49 oz/ton) Ir. Drilling of several short holes on the property yielded further spectacular results. In the first four holes, high-grade intercepts included: 1.52 m grading 13.72 g/t (0.4 oz/ton) Au, 78.55 g/t (2.29 oz/ton) Pt, and 18.52 g/t (0.54 oz/ton) Rh in DDH #1; and 1.52 m of 12 35 g/t (0.36 oz/ton) Au, 59 g/t (1.72 oz/ton) Pt, and 6.17 g/t (0.18 oz/ton) Rh in DDH #4. The mineralized sections also showed appreciable amounts of Ag, Pd, Os, Ru, and Ir.

Subsequent drilling continued to yield good results, although significant skepticism accompanied their release, particularly as analytical techniques employed were unconventional and fire assay's failed to reproduce high values. However, previous confirmation of anomalous gold values in the Devonian carbonates by Geological Survey of Canada scientists, and Lac Minerals Ltd.'s show of interest in the area and a report that "gold-bearing phases have been observed in some samples" precipitated a major staking rush. The Fort McKay gold=PGE(?) play has obvious implications for the Phanerozoic of northwest Saskatchewan where the same general stratigraphic section is displayed, however, only a few claims have been staked to date in this area. Also of interest to Saskatchewan geologists, familiar with the uranium deposits of the Athabasca Basin, is the proposal by Feng and Abercrombie, of the Geological Survey of Canada, that the mineralizing fluids at Fort McKay were highly saline brines migrating out of the Western Canadian Sedimentary Basin. Similar basinal brines were instrumental in transporting uranium and the myriad of other metals, including gold and PGE, that characterize the Athabasca Basin unconformity-type uranium deposits.

The fact that the wealth of the Athabasca uranium province was largely unrecognized 20 years ago illustrates clearly why this new environment for precious metal mineralization should be fully explored.

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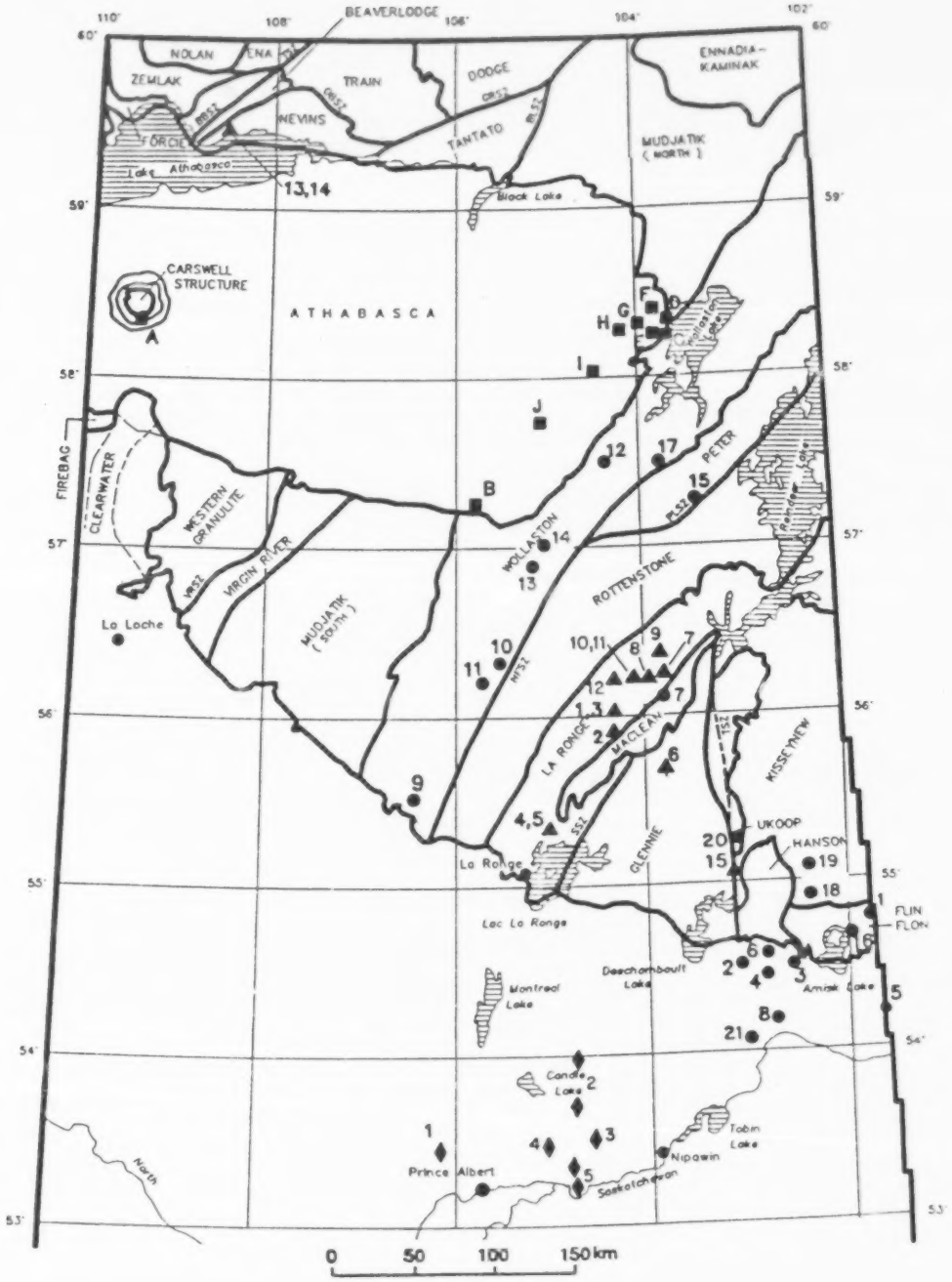

MINERAL DEPOSITS AND EXPLORATION AREAS

***Uranium** (squares): (A) Cluff Lake, (B) Key Lake, (C) Rabbit Lake, (D) Collins Bay–Eagle Point, (E) McClean Lake, Sue Trend, (F) Jeb, (G) Dawn Lake, (H) Midwest, (I) Cigar Lake, and (J) McArthur River, P2 North.*
***Gold** (triangles): (1) Jolu Mine, (2) Jasper Mine, (3) Star Lake Mine, (4) Contact Lake Mine, (5) Pap SW, (6) Seabee Mine, (7) Weedy B–Golden Heart, (8) Komis Mine, (9) Twin, (10) Comer, (11) Tower East, (12) Niko, (13) Box Mine, (14) Athona Mine, and (15) Wood Lake.*
***Base Metals** (circles): (1) Flin Flon and Callinan mines, (2) Bigstone Lake, (3) McDermott Lake, (4) Miskat Lake, (5) Namew Lake Mine, (6) McIlvenna Bay, (7) McKenzie/Peg, (8) Suggi Lake, (9) Duddridge, (10) Sito East, (11) Fable, (12) Johnson–Marina, (13) Janice, (14) Kaz, (15) Campbell River, (16) Birch Lake and Denare Beach, (17) George Lake, (18) Judique Lake, (19) Kakinagimak Lake, (20) Ukoop Lake, and (21) Mossy River.*
***Kimberlites** (diamonds): (1) Sturgeon Lake, (2) Candle Lake, (3) Snowden, (4) Foxford, and (5) Fort-à-la-Corne.*